

IN THE CLAIMS:

Kindly amend claims 1-4 and add new claims 5-20 as shown in the following listing of claims, which replaces all previous versions and listings of claims in this application.

1. (currently amended) A step motor control device for controlling operation of a step motor, the step motor control device comprising:

first and second switch elements ~~which are~~ connected to each other in series;

third and fourth switch elements ~~which are~~ connected to each other in series;

a coil of a step motor, the coil being ~~which is~~ connected between a node of the first and second switch elements and a node of the third and fourth switch elements;

a first series circuit ~~including~~ having a first detection element and a fifth switch element connected in parallel with the first switch element ~~and a first detection element~~;

a second series circuit ~~including~~ having a second detection element and a sixth switch element connected in parallel with the third switch element ~~and a second detection element~~;

a control means ~~that controls~~ for controlling an on/off operation of the first to fourth switch elements in response to a supplied drive pulse to allow a current to flow in the coil to rotationally drive the step motor, and for controlling ~~controls~~ an on/off operation of the ~~fourth, third, fifth, and third, fourth, fifth and sixth~~ switch elements in response to a rotation detection control pulse ~~that is~~ supplied during a rotation detection period immediately after the rotational drive of the step motor in accordance with the supplied supply of the drive pulse is completed; is finished ~~in a rotation detection period immediately after the rotation drive of the step motor in accordance with the drive pulse;~~ and

a detecting means ~~that detects~~ for detecting the presence/absence of the rotation of the step motor ~~on the basis of~~ in accordance with a comparison result ~~of~~ obtained by comparing a threshold voltage with a voltage generated between the coil and the first detection element of the first series circuit and with a voltage generated between the coil and the second detection element of the second series circuit. ~~elements and the coil with a threshold voltage;~~

~~wherein in the case where the step motor is rotationally driven by turning on the first and fourth switch elements in accordance with the drive pulse, the control means~~

~~renders the fourth and fifth switch elements on and controls the on/off operation of the third switch element at a given frequency in a first given period immediately after the supply of the drive pulse is finished, and renders the third switch element and the sixth switch element on and controls the on/off operation of the fourth switch element at a given frequency in a second given period after lapse of the first given period;~~

~~in the case where the step motor is rotationally driven by turning the second and third switch elements on in accordance with the drive pulse, the control means renders the third and sixth switch elements on and controls the on/off operation of the fourth switch element at a given frequency in the first given period immediately after the supply of the drive pulse is finished, and renders the fourth switch element and the fifth switch element on in the second given period and controls the on/off operation of the third switch element at a given frequency; and~~

~~the detection means detects the presence/absence of the rotation of the step motor on the basis of the comparison result of the voltage generated between the first detection element and the coil with the threshold voltage when the fifth switch element is turned on, and detects the presence/absence of the rotation of the step motor on the basis of the~~

~~comparison result of the voltage generated between the second detection element and the coil with the threshold voltage when the sixth switch element is turned on.~~

2. (currently amended) A step motor control device according to ~~claim 1, comprising: wherein~~ claim 1; wherein each of the first, third, fifth, and sixth switch elements are made up of comprises an n-channel MOS transistors, and transistor; and wherein each of the second and fourth switch elements comprises a ~~are made up of p-channel MOS transistors transistor.~~

3. (currently amended) A step motor control device according to ~~claim 1, comprising: wherein~~ claim 1; wherein each of the first and second detection elements comprises a resistor ~~are made up of resistors.~~

4. (currently amended) An electronic timepiece comprising: a plurality of hands for indicating time; a step motor for rotating the hands; and that rotates time hands; and a step motor control device according to claim 1 for controlling operation of the step motor. ~~that rotationally controls the step motor; wherein the step motor control device according to claim 1 is used as the step motor control device.~~

5. (new) A step motor control device according to claim 1; wherein when the step motor is rotationally driven by turning on the first and fourth switch elements in accordance with the drive pulse, the control means turns the fourth and fifth switch elements on and controls the on/off operation of the third switch element at a given frequency in a first given period immediately after the supply of the drive pulse is completed, and the control means turns the third switch element and the sixth switch element on and controls the on/off operation of the fourth switch element at a given frequency in a second given period after lapse of the first given period.

6. (new) A step motor control device according to claim 5; wherein when the step motor is rotationally driven by turning on the second and third switch elements in accordance with the drive pulse, the control means turns on the third and sixth switch elements and controls the on/off operation of the fourth switch element at a given frequency in the first given period immediately after the supply of the drive pulse is completed, and the control means turns on the fourth switch element and the fifth switch element in the second given period and controls the on/off operation of the third switch element at a given frequency.

7. (new) A step motor control device according to claim 6; wherein the detecting means detects the presence/absence of the rotation of the step motor in accordance with the comparison result obtained by comparing the threshold voltage with the voltage generated between the first detection element and the coil when the fifth switch element is turned on; and wherein the detecting means detects the presence/absence of the rotation of the step motor in accordance with the comparison result obtained by comparing the threshold voltage with the voltage generated between the second detection element and the coil when the sixth switch element is turned on.

8. (new) A step motor control device according to claim 7; wherein each of the first, third, fifth, and sixth switch elements comprises an n-channel MOS transistor; and wherein each of the second and fourth switch elements comprises a p-channel MOS transistor.

9. (new) A step motor control device according to claim 7; wherein each of the first and second detection elements comprises a resistor.

10. (new) An electronic timepiece comprising: a plurality of hands for indicating time; a step motor for rotating the hands; and a step motor control device according to claim 7 for controlling operation of the step motor.

11. (new) A step motor control device according to claim 1; further comprising comparing means for comparing the threshold voltage with the voltage generated between the coil and the first detection element of the first series circuit and with a voltage generated between the coil and the second detection element of the second series circuit.

12. (new) A control device for a step motor having a coil, the control device comprising:

first and second switch elements connected to each other in series, a node of the first and second switch elements being connected to one side of the coil during use of the control device;

third and fourth switch elements connected to each other in series, a node of the third and fourth switch elements being connected to the other side of the coil during use of the control device;

a first series circuit having a first detection element and a fifth switch element connected in parallel with the first switch element;

a second series circuit having a second detection element and a sixth switch element connected in parallel with the third switch element;

control means for controlling operation of each of the first and fourth switch elements during a step motor drive

period to turn the first and fourth switch elements ON to allow a current to flow in the coil for rotationally driving the step motor, for controlling operation of each of the fourth and fifth switch elements to turn the fourth and fifth switch elements ON and controlling an ON/OFF operation of the third switch element during a first step motor rotation detection period immediately after the rotational drive of the step motor is stopped, and for controlling operation of each of the third and sixth switch elements to turn the third and sixth switch elements ON and controlling an ON/OFF operation of the fourth switch element during a second step motor rotation detection period after lapse of the first step motor rotation detection period;

comparing means for comparing a threshold voltage with the voltage generated between the coil and the first detection element of the first series circuit when the fifth switch element is turned ON, and for comparing a threshold voltage with the voltage generated between the coil and the second detection element of the second series circuit when the sixth switch element is turned ON; and

detecting means for detecting a rotational driving state of the step motor in accordance with a voltage comparison result from the comparing means.

13. (new) A control device according to claim 12; wherein each of the first, third, fifth, and sixth switch elements comprises an n-channel MOS transistor; and wherein each of the second and fourth switch elements comprises a p-channel MOS transistor.

14. (new) A control device according to claim 12; wherein each of the first and second detection elements comprises a resistor.

15. (new) An electronic timepiece comprising: a plurality of hands for indicating time; a step motor for rotating the hands; and a control device according to claim 12 for controlling an operation of the step motor.

16. (new) A control device for a step motor having a coil, the control device comprising:

first and second switch elements connected to each other in series, a node of the first and second switch elements being connected to one side of the coil during use of the control device;

third and fourth switch elements connected to each other in series, a node of the third and fourth switch elements being connected to the other side of the coil during use of the control device;

a first series circuit having a first detection element and a fifth switch element connected in parallel with the first switch element;

a second series circuit having a second detection element and a sixth switch element connected in parallel with the third switch element;

control means for controlling operation of each of the second and third switch elements during a step motor drive period to turn the second and third switch elements ON to allow a current to flow in the coil for rotationally driving the step motor, for controlling operation of each of the third and sixth switch elements to turn the third and sixth switch elements ON and controlling an ON/OFF operation of the fourth switch element during a first step motor rotation detection period immediately after the rotational drive of the step motor is stopped, and for controlling operation of each of the fourth and fifth switch elements to turn the fourth and fifth switch elements ON and controlling an ON/OFF operation of the third switch element during a second step motor rotation detection period after lapse of the first step motor rotation detection period;

comparing means for comparing a threshold voltage with the voltage generated between the coil and the first detection element of the first series circuit when the fifth

switch element is turned ON, and for comparing a threshold voltage with the voltage generated between the coil and the second detection element of the second series circuit when the sixth switch element is turned ON; and

detecting means for detecting a rotationally driving state of the step motor in accordance with a voltage comparison result from the comparing means.

17. (new) A control device according to claim 16; wherein each of the first, third, fifth, and sixth switch elements comprises an n-channel MOS transistor; and wherein each of the second and fourth switch elements comprises a p-channel MOS transistor.

18. (new) A control device according to claim 16; wherein each of the first and second detection elements comprises a resistor.

19. (new) A control device according to claim 16; wherein the control means comprises a motor drive circuit, a rotation detecting circuit, and a control circuit for controlling the motor drive circuit to rotationally drive the step motor and controlling the rotation detecting circuit to detect the rotational driving state of the step motor.

20. (new) An electronic timepiece comprising: a plurality of hands for indicating time; a step motor for rotating the hands; and a control device according to claim 16 for controlling operation of the step motor.